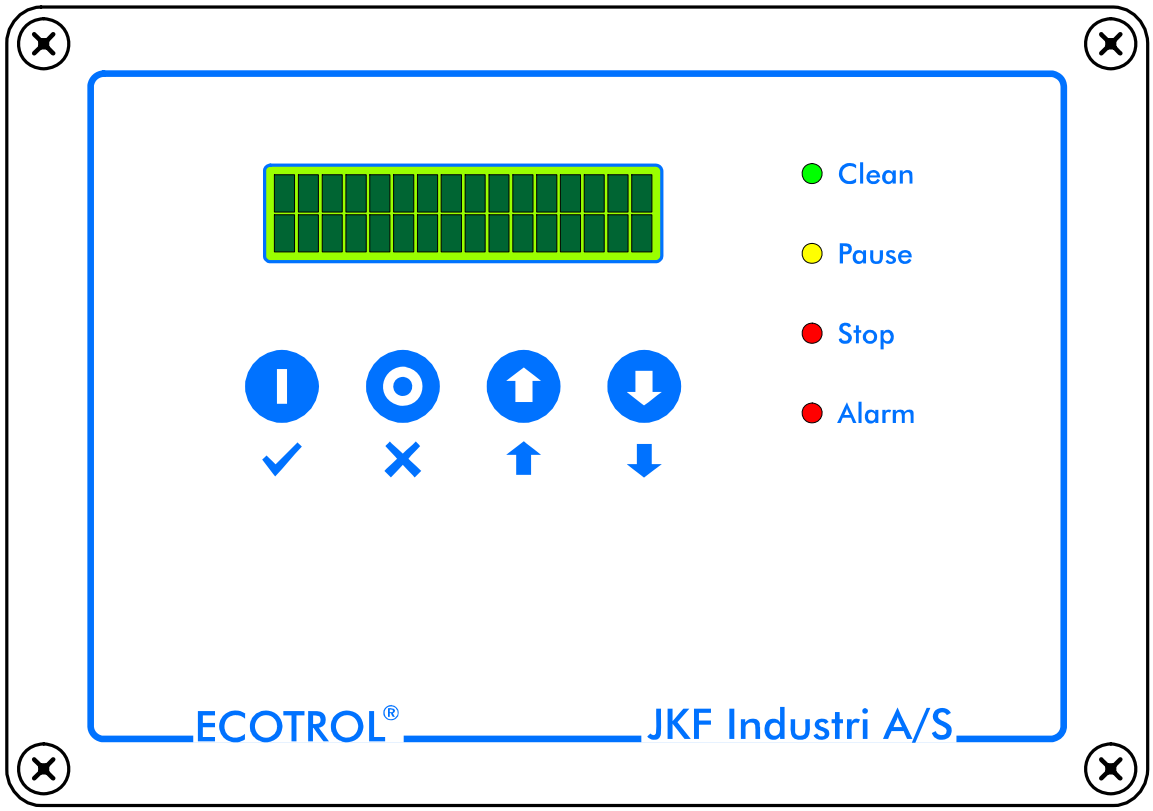
Installation Manual
ECOTROL® Control



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1.0 General Description

ECOTROL® has been developed to control the cleaning sequences in CT and DS filters from JKF Industri A/S.
By means of the display unit the user can see actual data and adjust a number of control parameters. ECOTROL® can run as stand alone (must always have a start signal from the main fan) or interfaced with PLC/relay control.

If ECOTROL® is initiated without time control, the differential pressure across the filter is monitored. A user set point defines the time for the cleaning to be initiated. The actual airflow in the filter bags is measured, and the optimal shot pressure for cleaning is calculated.

The time control mode allows the filter to be cleaned at intervals between 10-1440 minutes. Each interval can be defined to include 1-10 cleaning events.

The combined differential/time control works according to the time control procedures. However, additional cleaning will be initiated if the differential pressure across the filter should exceed the pre-defined value.

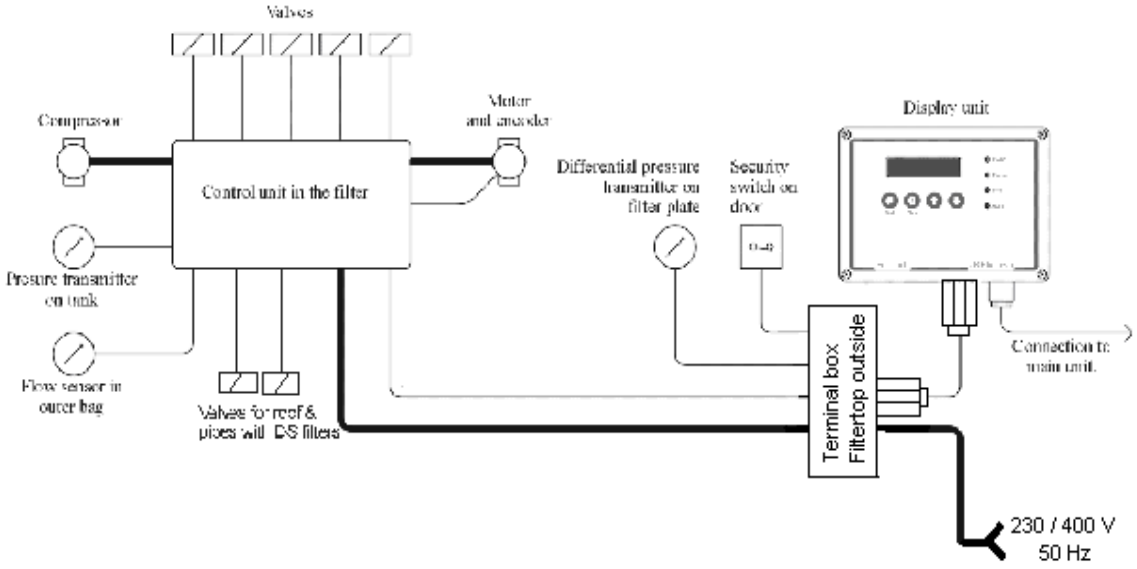
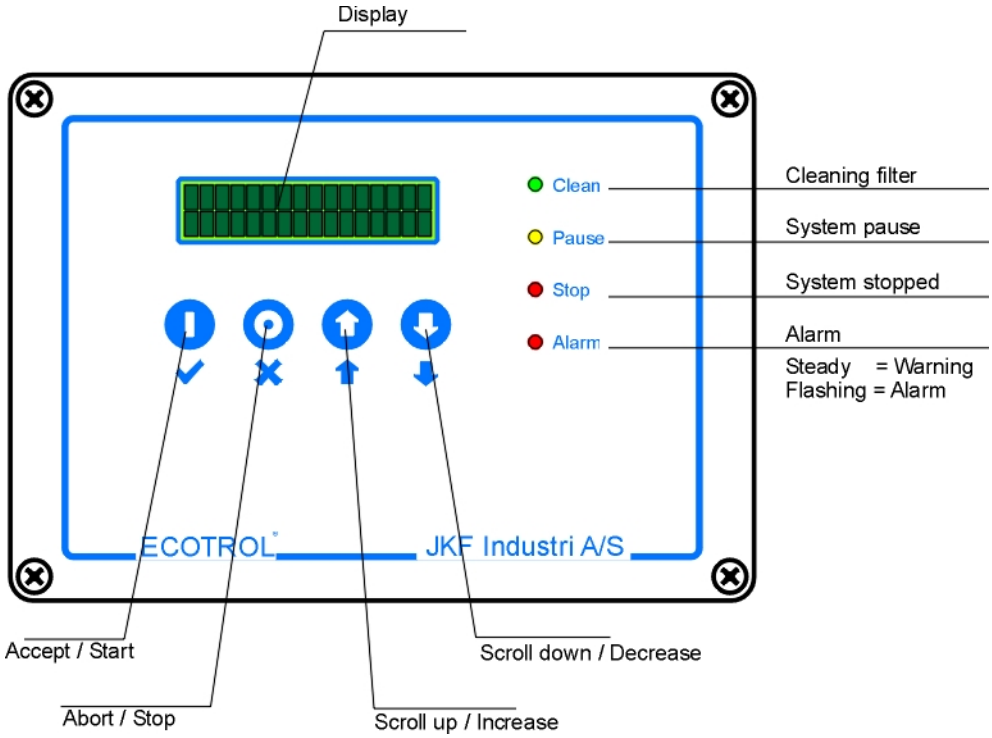


Figure 2. System Overview

1.1 ECOTROL® Front Description



Symbol	Description	Function
	Start / Confirm	1: To initiate control 2: To get access to settings (press 3 sec.) 3: To confirm changes
[1)]	**Stop / Cancel**	1: To stop cleaning (one press and the ongoing cleaning is completed before stop) (two short presses – total stop) 2: To exit settings (press 3 sec.) 3: To cancel changes
	Scroll up / Increase	1: To see next data 2: To increase data in settings
	Scroll down / Decrease	1: To see previous data 2: To decrease data in settings

[1]) Stop function also as external signal (RESET) on terminal 15 and 16.

1.2 Display - Indication of Data

On turning on the control, the display shows a “chess square”, and the light-emitting diodes will light one after another so as to test the unit. When the control is ready for operation, the following will be indicated on the display:

ECOTROL®
JKF Industri A/S

The keys ⬇ and ⬆ can be used to scroll through the various measurement inputs and statuses. In the event of alarm/warning, the same keys can be used to see such alarm/warning. The top line of the display indicates:

Operation Data:

The following data may be shown:

Display	Description
Status	Operation status
Alarm “no.”:	Only visible if one or more alarms/ Warnings are active (alarm “no.” is read, see paragraph 1.3.1)
Inlet **Diff.Pres xxxx**	Actual differential pressure across filter (mm WG)
Inlet **Compr.Pres xxxx**	Actual pressure in compressor (bar)
Inlet **Filter Flow xxxx**	Air velocity in filter bag (m/s) (Only measured during cleaning)

By start the programme version can also be read.
Control panel 2,2
Cleaning carriage 1,2
In case of alarms they will also be readable.

1.3 Status

Under “Status” the state of control in the cleaning sequence is indicated along with any alarms or warnings. If several errors have been detected, use the ⬇ and ⬆ keys to scroll through the error items.
Press ⊙ to reset any alarm/warning or external signal on terminal 15 and 16. If an error has not been corrected, the alarm/warning will remain on the display. In the event of alarm/warning, technical personnel should be called in (see paragraph 3.2).

1.3.1 Indication of Status

The top line of the display indicates: **Status:**
The following operation function/alarms/warnings may be shown:

Display	Description
Stop, Service	Control under service – no cleaning
Stop	Control has stopped - no cleaning
Cleaning	Control is cleaning
Pause	Control awaits start conditions for cleaning
Stop, Alarm	Critical equipment fault Control has stopped
Stop, Warning	The control has stopped – no cleaning No critical equipment fault – can operate at reduced capacity.
Cleaning, Warning	The control is cleaning. No critical equipment fault – can operate at reduced capacity.
Pause, Warning	The control awaits start conditions for cleaning No critical equipment fault – can operate at reduced capacity.
Initiating	Control is preparing for operation
Initiating, Warn.	Control is preparing for operation - can operate at reduced capacity

In front of each status item, two symbols may occur, ***** and **+**.

***** = will indicate that control awaits compressor timeout, defined in set-point Compr.Pause (see paragraph 2.1.3).

+ = will indicate that control is running final cleaning.

1.3.2 Warning Description

The top line of the display indicates:

Warning:

Item	Display	Description
10	**Valve Number "No"**	Defective valve No. "No"

The valve number is counted out from the middle.

1.3.3 Alarm Descriptions

The top line of the display indicates:

Alarm:

Item	Display	Description
20	**More Valves**	Several defective valves
32	**Service Active**	(DS only!) Service mode - for opening of the roof
40	**VLT Not Ready**	Frequency converter not ready
41	**Position Error**	Encoder, VLT (frequency converter) or motor fault
42	**Compressor Error**	Compressor unable to build up pressure
43	**Diff.Pres. Error**	Differential pressure gauge (JK-500D) fault

See also paragraph 3.2

1.3.4 Alarm Descriptions Related to Activation of Digital Input (see paragraph 5.0)

Digital input, IN2, is applied in CT equipment for door switch in order to protect against unintentional access to the filter. For DS equipment the input is used as an external stop. The input has been provided with internal pull-up and will be activated by interruption (NPN).

Item	Display	Description
30	**Ext. Stop Active**	IN2 is/was activated (see paragraph 5.2)

2.0 Access and Setup of Set points

Press the key until “Setup, Select” is indicated on the display.
Then use the and keys to scroll through the menu list. To adjust a setting, press shortly and “Setup, Change” will be indicated on the display. Then use the and keys to increase or decrease data by one unit. Press to confirm changes, or press to cancel changes.

To return to normal display, press the key and hold it down until the last measurement data selected is shown.

2.1 Set points List

The control includes 3 types of set points:

Set points - User	Set points necessary for the daily operation
Set points - Master	Set points to adjust and service the equipment
Set points - System	Set points for primary setup of the equipment

2.1.1 Set points - User

Display	Set point Description	Min.	Max.	Std.
Lng./Spr:	Selection of language			
Fnc.:	Selection of cleaning function Differential pressure/Time control/Diff.&Time	Diff. Press.	Time/-D.Press	Time/-D.Pres
StartPress.	Start differential pressure (mmWG)	0	500	100
CleanIntrv.	Cleaning interval when time control (Minutes)	10	1440	60
No.OfClean.	Number of cleaning events when time control	1	10	1
ServiceMode	***Note! To be used with DS equipment only !!*** Activation of service mode	No	Yes	No
Open Top:	***Note! To be used with DS equipment only !!*** Opening of the roof	No	Yes	No
MasterSetup:	Indication of MasterSetup	No	Yes	No

Note! On Fnc/ServiceMode/MasterSetup, only relevant settings are shown.

2.1.2 Set points - Engineer

Display	Set point Description	Min.	Max.	Std.
Lo.ShotPrs.	Minimum shot pressure (bar)	1,5	Max-0,1	2,0
Hi.ShotPrs.	Maximum shot pressure (bar)	Min +0,1	5,5	3,5
Flow Measur.	Activation of flow meter No: No flow measuring 1:Flow measuring by AFS035 2:Flow measuring by JK-500D (100 mmWG)	No	2	2
Min. Flow	Flow similar to Minimum “Lo.ShotPrs.”	1	Max-0,1	1,0
Max. Flow	Flow similar to Maximum “Hi.ShotPrs.”	Min +0,1	35	20
SystemSetup	Indication of system settings	No	Yes	No

Note! On selection of FlowMeasur. only relevant settings are shown.

2.1.3 Set points - System Settings

Display	Setpoint Description	Min.	Max.	Std.
FilterType:	Selection of filter type 1: CT36 2: CT60 3: CT84 4: CT90 5: DS12 6: DS20 7: DS28 8: DS36 9: DS44			
Filt.Length	Bag length (metres)	2,0	4,0	
EncoderImp.	Encoder pulses per revolution	5	20	10
GearRatio	Gear exchange *****	250,0	500,0	380,9
NulDistance	Distance mechanical stop to first bag row (ETD)	0	1000	
Park.Angle	Parking position (°)	0	340	
FlowMs.Time	Time from stop to flow measuring	0,0	2,0	0,5
Compr.Pause	Minimum pause for compressor (seconds)	180	500	240
Ext. Compr. Air	Is external compressed air used	No	Yes	

***** See paragraph 2.2 for settings

2.2 Encoder Trin Distance (ETD) - explanation

The “disparate” jumps in some of the settings have been described in the following.

Encoder **T**rin **D**istance (ETD) is defined as the distance equal to one encoder step.

This means that the ETD value will depend on filter type, gear and encoder.

The distance is calculated on the basis of the radius equal to the outer shot valve, and the values in the following table are based on a 10-pulses/revolution encoder. All units are in mm.

Filter Type	ETD with 1:348.0 Gear	ETD with 1:380.9 Gear
CT-36	0,26	0,24
CT-60	0,35	0,32
CT-84	0,43	0,41
CT-90	0,43	0,41
DS-12	0,19	0,18
DS-20	0,27	0,26
DS-28	0,32	0,30
DS-36	0,40	0,37
DS-44	0,44	0,41

All values are rounded to one decimal place on the display.

ETD applies to set point “NulDistance” that is defined as the distance from mechanical stop to first filter bag. The distance is measured from the centre of the outer shot valve to the centre of the first filter bag.

3.0 Function Selection

The operation mode is selected by means of set point.

3.0.1 Differential Control

In this control mode the differential pressure across the filter is continuously monitored. The user set point StartPress defines the time for the cleaning to be initiated. Once cleaning has been finished, the carriage will return to parking position and await next increase in pressure.

3.0.2 Time Control

This control mode allows the filter to be cleaned at intervals between 10-1440 minutes (set point CleanIntrv.). Each interval can be defined to include 1-10 cleaning events (set point No.OfClean.).
The cleaning is based on time only, irrespective of the differential pressure across the filter.

3.0.3 Combined Differential/Time Control

This control mode works according to the time control procedures. However, additional cleaning will be initiated if the differential pressure across the filter should exceed the pre-defined value.

3.1 Start

To start up for the first time or after a stop, press . The control can also be activated externally via input “start/stop” on the display unit (see paragraph 5.2 Terminal Description).
Before cleaning, a “preparing event” will elapse. The text “*Initiating”* will be indicated under the *“Status”* menu.

Finally, depending on whether the cleaning condition has been complied with,

the cleaning carriage will go to the pre-defined parking position,
or it will go direct to the first position in the cleaning sequence.

3.2 Errors Related to Commissioning (starting up)

Especially during commissioning, errors may occur.
The reasons for some of the occurrences of “Alarm 41: Position Error” related to the preparing event have been described in the following.

“**Alarm 41**” will be reported if the control signals to the motor to run in one direction and receives a signal from the encoder that the motor has come to a standstill or runs in the opposite direction.

“**Alarm 41**” can also be due to a fault somewhere from the control through VLT (frequency converter), motor, gear, encoder and back to the control. Also certain mechanical defects may activate this alarm.

“**Alarm 41**” will normally be activated if something should become squeezed during the daily operation.

If the cleaning carriage does not move at all, and alarm occurs approx. 8 seconds after start, the reason could be one of the following:

- Error in connections from VLT to motor
- Motor lacks a phase
- Motor is not connected to 3 x 230 V AC (must be a delta connection)
- Error in connections from control to VLT
- Transport protection has not been removed
- Defect motor, gear, VLT or controlling board

If the cleaning carriage moves forth for one second and then a sudden step back and forth:

- Error in connections from control to encoder
- The two-encoder outputs have been switched
- Missing magnet on motor shaft (if hall type encoder)
- Defect encoder or controlling board

If the cleaning carriage moves back for one second and then a sudden step forth and back:

- Motor has been phased incorrectly

If the cleaning carriage goes the wrong way during the entire preparing event:

- Motor has been phased incorrectly; the two-encoder outputs have been switched

If the cleaning carriage moves forth for one second and the back toward mechanical stop for a long time:

- Gear has been fastened improperly on centre shaft
- Defective gear or mechanical stop.

3.3 Stop

3.3.1 Stop Final Cleaning

Press **once** to stop an ongoing cleaning event (at minimum shot pressure). The control will be idle while the compressor pauses (set point Compr.Pause) whereupon final cleaning will be initiated. Final cleaning will be performed at minimum shot pressure (set point Lo.ShotPrs.). The carriage returns to parking position.

3.3.2 Immediate Stop

At any time the control can be discontinued by pressing ***twice***. The carriage will not return to parking position. On pressing either the cleaning event will be initiated if the conditions are present, or the carriage will return to parking position.

3.3.3 Stop via External Connection

On stopping cleaning via the external connection, any ongoing cleaning event will be stopped (at minimum shot pressure). The control will be idle while the compressor pauses (set point Compr.Pause) whereupon final cleaning will be initiated. Final cleaning will be performed at minimum shot pressure (set point Lo.ShotPrs.). The carriage returns to parking position.

4.0 Service

4.0.1 WARNING !!

Great care is required during any access to the filter. It is ***deadly dangerous*** to short-circuit the safety device that protects against unintentional access during operation.
The control should be turned off or set in service mode (see below) before access to the filter is made.

4.0.2 Service Mode for DS Equipment

Select parameter ServiceMode (see paragraph 2.0 Access and Setup of Set points) and set data to "Yes".
The control is now in service mode, and the roof can be opened by means of parameter Open Top

4.1 Maintenance of flow meter

At least once each 6th month the flow meter type JK-500D (100 mm) must be inspected. The internal fitted filter on the high-pressure side is replaced. The filter on the low-pressure side is checked and cleaned by compressed air or alternatively replaced.

4.2 Compressor Check

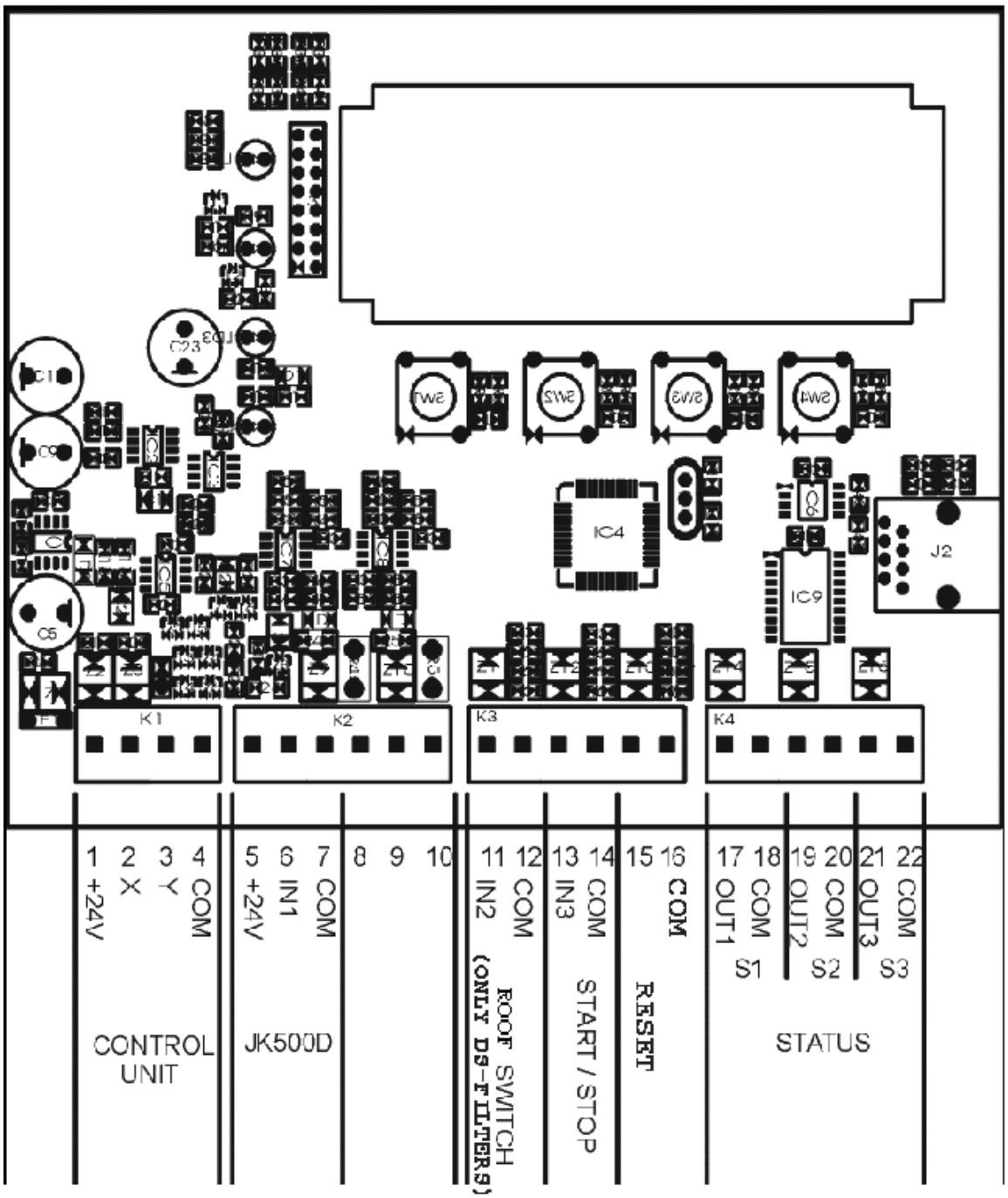
When the equipment is inspected for the first time, it is important to check the compressor revolution direction.

The test button on switches C5 (see Manual for control cabinet) can be used for manual operation of the compressor. An arrow on the compressor jacket indicates the motor revolution direction.

4.3 Valve Numbering

Valve No. 1 is located closest to the motor. The other valves have been numbered so that the last one has been located farthest toward the wall of the filter.

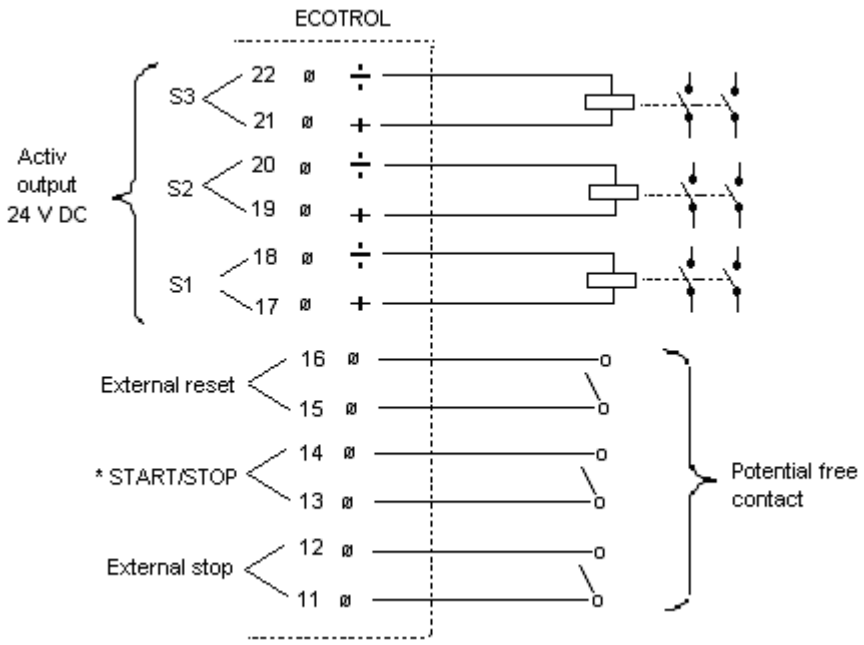
5.0 Display Unit Connections



5.1 Terminal Description

Item	Designation	Description
1	+24V	+24 V DC to display unit. From control cabinet terminal X4-37
2	X	Bus signal. From control cabinet terminal X4-38
3	Y	Bus signal. From control cabinet terminal X4-39
4	COM	-24 V DC to display unit. From control cabinet terminal X4-40
5	+24V	+24 V DC to differential pressure gauge. From control cabinet terminal X4-22
6	IN1	Analogue input from differential pressure gauge. From control cabinet terminal X4-23
7	COM	Not used
8		Not used
9		Not used
10		Not used
11	IN2	CT-equipment: digital input from door switch DS-equipment: external stop
12	COM	CT-equipment: digital input from door switch DS-equipment: external stop
13	IN3	Digital input from PLC/relay. External start/stop signal *
14	COM	Digital input from PLC/relay. External start/stop signal *
15	IN4	External RESET. Has the same function as the key
16	COM	External RESET. Has the same function as the key
17	OUT1	Status output S1 to PLC
18	COM	Status output S1 to PLC
19	OUT2	Status output S2 to PLC
20	COM	Status output S2 to PLC
21	OUT3	Status output S3 to PLC
22	COM	Status output S3 to PLC

* Terminals 13 and 14 are connected with a switch. Switch on/off to initiate/stop cleaning.



*Terminal 13 and 14 are connected via an end-/break switch. The filter plant is started via this switch. In this way the ECOTROL®-Control is activated by connecting and stopped by disconnecting the switch.

5.2 Status Outputs

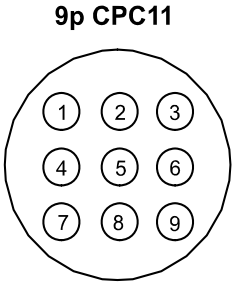
S1	S2	S3	
L	L	L	Alarm, Stop / Power failure
H	L	L	Warning, Stop
H	H	L	Warning, Pause
L	H	L	Warning, Cleaning
L	L	H	Service, Stop
H	L	H	Stop
H	H	H	Pause
L	H	H	Cleaning

H= 24 V DC
L= 0 V DC

Regarding S3
Can be used as an alarm outlet
L= Alarm
H= No alarm

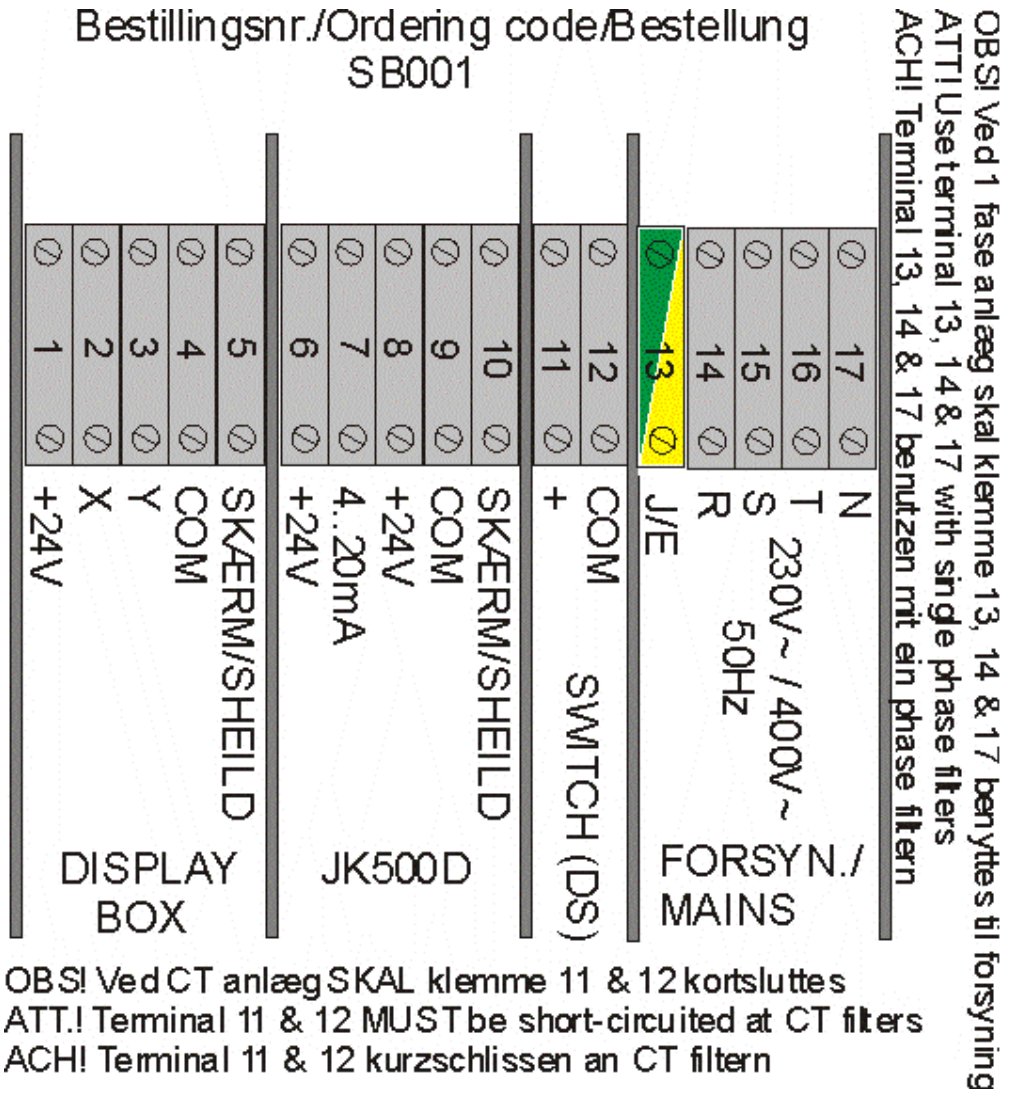
5.3 Connections on 9p CPC11

As indicated below, connections have been made to the socket on the front of 9p CPC11 from where they can be connected to joint box SB001 via connection cable CPC-9-13.



Item	Designation	Description
1	+24V	+24 V DC to display unit. From control cabinet terminal X4-37
2	X	Bus signal. From control cabinet terminal X4-38
3	Y	Bus signal. From control cabinet terminal X4-39
4	COM	-24 V DC to display unit. From control cabinet terminal X4-40
5		Not used
6	Screen	Screen
7	4..20mA	From differential pressure gauge JK-500D
8	IN2	CT equipment: digital input from door switch DS equipment: external stop
9	COM	CT equipment: digital input from door switch DS equipment: external stop

5.4 Terminal box SB001 on the outside of the top section



6.0 Electrical and Air connection

Supply 230 V~ /400 V~
ECOTROL®-controller must always stand with voltage.
Connecting box (look 5.4)

Clamp
17 – N = N
16 – T = L3 1 L (14) + N (17) = 230 V~
15 – S = L2 * 3 L (14, 15, 16) + N (17) = 400 V~
14 – R = L1
13 – J/E = JORD
* Is necessary if the cleaning system is assembled with a 3-phased compressor.

Communication connections (passage 5.0-1-2)

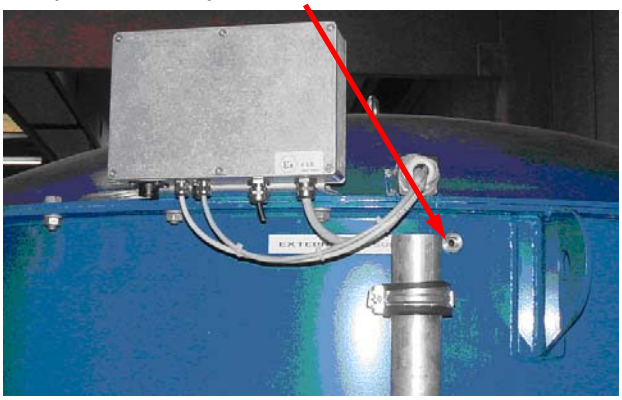
External START/STOP (terminal (13 and 14)) must always be connected.

Alarm information from ECOTROL®-cleaning control system is read out from the state exits S1-S2-S3.

External stop is an alarm contact. If this contact is disconnected, all cleaning stops and the cleaning system is not able to run again until the contact is of and the alarm reset.
Standard connection of external stop:
- By CT-equipment external stop is not used. Clamp11 and 12 is short circuited in the connecting box (look passage 5.4).
- By DS-equipment external stop clamp 11 and 12 are connected to the roof contact.

External reset
- Has got the same function as key (look passage 3.3-1-2-3)
- External reset of alarm (look passage 1.3)

Connection of compressed air
Equipment which is prepared to clean with external compressed air, is connected to dry compressed air by shot bush, ¼" internal screw thread.



Supply: 350 NL/min
Pressure:
Min.: 5,0 bar
Max.: 8,0 bar

For DS-36 and DS-44
Pressure:
Min.: 7,0 bar
Max.: 8,0 bar